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February 14, 2002

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FEB 14 2002

FEDERAL COMMUNICATIONS COMMISSION
OFFICE OF THE SECRETARY

VIA HAND DELIVERY

Mr. William F. Caton
Acting Secretary
Federal Communications Commission
445 Twelfth Street, S.W.
Washington, D.C. 20554

Re: ET Docket No. 01-278 /
ERRATUM to February 12, 2002 filing of the Short Range
Automotive Radar Frequency Allocation Group

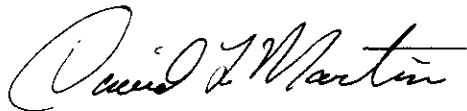
Dear Mr. Caton:

On February 12, 2002, I filed comments on behalf of the Short Range Automotive Radar Frequency Allocation ("SARA") Group in response to the Commission's Notice of Proposed Rulemaking in ET Docket No. 01-278. The comments were erroneously captioned "ET Docket No. 01-108."

I am attaching hereto a file-stamped copy of the cover page from the original filing, as well as a corrected version of the comments showing the proper docket number. Please associate these revised comments with the record in ET Docket No. 01-278.

Please contact me if you have any questions.

Respectfully submitted,



David L. Martin
Counsel to the Short Range Automotive
Radar Frequency Allocation Group

Attachment

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Before the
Federal Communications Commission
Washington, D.C. 20554

In the Matter of

Review of Part 15 and other Parts of the
Commission's Rules

ET Docket No. 01-108

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FEDERAL COMMUNICATIONS COMMISSION
OFFICE OF THE SECRETARY

To: The Commission

**COMMENTS OF
THE SHORT RANGE AUTOMOTIVE
RADAR FREQUENCY ALLOCATION GROUP**

The Short Range Automotive Radar Frequency Allocation Group ("SARA"), 1/ by its attorneys, hereby submits comments in response to the Notice of Proposed Rulemaking and Order (the "NPRM") released by the Federal Communications Commission (the "FCC" or the "Commission") on October 15, 2001 in the above-captioned proceeding. 2/ In the NPRM, the FCC requested comments on two issues relating to Part 15 emission limits above 2 GHz: (1) whether to make any changes to the restricted band designation that currently applies to all frequencies above 38.6 GHz, and (2) whether to require radar detectors or other receivers operating

1/ SARA is made up of the following automotive component manufacturers: A.D.C., Bosch, Delphi Automotive Systems, Hella, InnoSent, Megamos, Siemens VDO, TRW, Tyco Electronics, Valeo and Visteon. It also includes the following automobile manufacturers: Audi, BMW, DaimlerChrysler, Fiat, Ford, General Motors, Jaguar, MAN, Opel, Porsche, PSA Peugeot Citroën, Renault, Saab, Seat, Skoda, Volkswagen and Volvo.

2/ Review of Part 15 and other Parts of the Commission's Rules, Notice of Proposed Rulemaking and Order, FCC 01-290, ET Docket No. 01-278 (rel. Oct. 15, 2001) ("NPRM").

Before the
Federal Communications Commission
Washington, D.C. 20554

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2/ *Review of Part 15 and other Parts of the Commission's Rules*, Notice of Proposed Rulemaking and Order, FCC 01-290, ET Docket No. 01-278 (rel. Oct. 15, 2001) ("NPRM").

above 960 MHz to comply with the Part 15 emission limits.^{3/} These comments respond to both issues.

I. Background

SARA is composed of the world's leading automobile manufacturers and automotive component manufacturers, working together to promote the development and deployment of short-range vehicular radar systems that will take the industry to a new level of automotive safety. These short-range radars ("SRRs") will serve as the core component of the next generation of collision mitigation systems, currently in active development. By integrating SRRs into an automobile's existing safety systems, the incidence and severity of automotive accidents can be greatly reduced. For example, brakes can be applied automatically to avoid or mitigate an impending collision with a car ahead that is unseen by a distracted driver. Seat belts can be tightened and other restraint systems can be adjusted for optimal deployment depending on the expected severity and position of impact.

The public safety benefits of such systems would be significant. Statistics from the National Highway Transportation Safety Administration ("NHTSA") indicate that SRR could address 88 percent of all causes of rear-end collisions.^{4/} Additionally, SRR would help compensate for visual "blind spots" and would make

^{3/} See *NPRM* at ¶¶ 6-14.

^{4/} See *SARA ex parte* filing of November 14, 2001 in ET Docket 98-153, at page 5 of Attachment

street crossings safer for pedestrians.

The Commission previously allocated 76 – 77 GHz for long-range automotive radars, and these bands are currently supporting collision warning and adaptive cruise control systems.⁵ Nevertheless, the members of SARA, although developing a variety of different (and eventually competing) SRRs, have collectively determined that operations centered at 24.125 GHz would provide optimal results given the objectives of SRR systems. 77 GHz radars suffer from unacceptable attenuation through bumper material and high production costs. By comparison, 24 GHz sensors can be assembled from off-the-shelf components, resulting in more economical production costs that will permit the life-saving benefits of SRR to reach a much larger segment of the car-buying public.

Most of the SRRs being developed by SARA members will rely on some form of ultra-wideband ("UWB") operation and SARA has been an active participant in the Commission's on-going UWB proceeding.⁶ The use of pulsed or pulse-equivalent UWB signals will permit high resolution sensing of objects around a vehicle. In addition, most of the SRRs will also incorporate a second, narrowband mode employing continuous-wave Doppler techniques. This narrowband mode is useful for measuring the precise speed of target objects.

(citing NHTSA statistics).

⁵/ See *Amendment of Parts 2, and 15 of the Commission's Rules to Permit Use of Radio Frequencies Above 40 GHz for New Radio Applications*, Third Report and Order, 13 FCC Rcd 15074 (1998) ("77 GHz Third Report").

II. The Commission Should Lift the Blanket Restricted Status of Frequencies above 38.6 GHz, Maintaining Protection Only for Bands with Sensitive Services

SARA strongly supports removal of the "restricted band" designation that currently applies to the entire frequency range above 38.6 GHz. Only spurious emissions are permitted in restricted bands, and such emissions must comply with the 500 $\mu\text{V/m}$ limit contained in Section 15.209 of the Commission's rules. ^{7/} This limit is lower than the limits that otherwise would be permitted by certain other rule sections in Part 15. As the NPRM correctly notes, compliance with the Part 15 rules are more difficult to achieve for devices producing harmonic emissions above 38.6 GHz, including transmitters operating in the 24 GHz band, such as the proposed SRRs.

When operating in Doppler mode, the SRR devices under development by SARA members would operate in accordance with Section 15.249, taking advantage of the higher fundamental frequency power limit permitted by that section in the 24.0-24.25 GHz band. ^{8/} The section also provides for a higher limit of 2500 $\mu\text{V/m}$ for harmonic emissions. However, because all harmonic emissions from a 24 GHz device will fall above 38.6 GHz, this higher limit is illusory. ^{9/} As noted in the

^{6/} See ET Docket 98-153.

^{7/} All field strength limits contained in FCC rules mentioned herein are calculated based on a measurement distance of three meters.

^{8/} 47 C.F.R. § 15.249 permits a fundamental frequency field strength of 250 mV/m in the 24.0 – 24.25 GHz band.

^{9/} SARA notes that SRR devices could not qualify for the higher (7.5 mV/m) restricted band

NPRM, for example, "the second harmonic from 24 GHz transmitters operating under Section 15.249 would be permitted a field strength 5 times greater if it were not in a restricted band." 10/

When initially adopted, the rule restricting the frequencies above 38.6 GHz was of little consequence to device manufacturers because there was no rule requiring measurements above that frequency. The same is not true today. Pursuant to Section 15.33(a)(2), 24 GHz SRRs would have to be measured up to the their fourth harmonic at 97 GHz. 11/

There are no acceptable technical solutions for suppressing all harmonic emissions from 24 GHz SRRs to the 500 $\mu\text{V/m}$ limit when the fundamental emission is at 250 mV/m, as permitted by Section 15.249. While the addition of coupling structures on the microstrip layout may be adequate to mitigate even-numbered (i.e., the second and fourth) harmonics, they are ineffective in suppressing odd-numbered harmonics such as the third harmonic at 72 – 72.75 GHz. 12/

harmonic limit available in Section 15.245, as this rule prohibits the continuous operation of vehicle-mounted field disturbance sensors. Without continuous operation, SRRs would be unable to assist, for example, in reducing rear-end collisions.

10/ NPRM at n. 19.

11/ 47 C.F.R. § 15.33(a)(2) requires measurements to the lower of the fifth harmonic or 100 GHz. Because the fifth harmonic of 24.25 GHz is 121.25 GHz, the SRR devices would only need to be measured to the fourth harmonic.

12/ The design of microstrip bandpass filters is based on resonant periodic structures that combine several open and shortened lines. The physical length of such microstrip lines corresponds to the required center frequency of the resonator and is one quarter of the wavelength of the center frequency, f_0 . Without losses the input impedance of such line is described as $Z_{in} = jZ_0 \tan(0.5\pi f/f_0)$. The functions tangens, x, is a periodic function that converges to infinite for $x = n\pi/2$ and $n = 1, 3, 5, \dots$. This means that the bandpass characteristic over frequency of such filter is periodic and the bandpass is open at the fundamental and odd harmonics, while the even

The application of additional bandpass filters onto the SRR antenna to reduce harmonic emissions, including the third harmonic, poses formidable technical and economic complications. Bandpass filters require additional space and would increase significantly the size of the device, thereby decreasing device placement flexibility. Moreover, the presence of filters on the antenna would hinder operations when in low-power wideband mode. To solve this dilemma, the SRR theoretically could be designed with two antennae – one with and one without a bandpass filter – but this again would increase the size of the device. More importantly, these technical workarounds required to satisfy the lower harmonic emission limit would impose significant additional costs, more than doubling the price of the device.

If vehicle manufacturers determine that a higher price makes the device economically unfeasible, or if deployment is limited to high-end vehicles, the public safety benefits of SRR will be lost or greatly diminished. The Commission has previously recognized the importance of promoting the availability of vehicular radars to the public. Notably, in the proceeding adopting rules for 77 GHz long-range radar ("77 GHz Proceeding"), the Commissions stated that:

We concur . . . that adoption of [the lower] proposed spurious emission limits would increase the cost of these [radar] devices and result in the delay or interruption of availability of these beneficial devices to the public. Depriving the public of or eliminating the availability of these unlicensed devices, which will enhance the safety of travel of the public

harmonics fall within the stop band and are suppressed.

via motor vehicles, would be contrary to the public interest. 13/

To ensure that the life-saving potential of SRRs will not be stymied by outdated regulations, the Commission should enable manufacturers to use the harmonic emission limit already contemplated for 24 GHz devices in Section 15.249. SARA submits that the most logical way to accomplish this is to remove the blanket restricted band designation on frequencies above 38.6 GHz. Instead of unnecessarily restricting this entire swath of spectrum, the Commission should follow the same method it employs below 38.6 GHz and restrict only those specific frequency bands in need of protection – i.e., those bands where passive or other sensitive radio services operate.

If, for whatever reason, the Commission decides against lifting the blanket restricted band designation, SARA requests that the Commission at least remove the designation from the 72.0 – 72.75 GHz band, so that 24 GHz SRR devices can take advantage of the 2500 μ V/m limit contained in Section 15.249 to accommodate their hard-to-suppress third harmonic. No passive services would be adversely affected by permitting the higher limit in this band. According to the Table of Frequency Allocations, the 71.0 – 74.0 GHz band is shared by fixed, fixed satellite, mobile and mobile satellite services. 14/ In addition to these services, U.S.

13/ *Amendment of Parts 2, and 15 of the Commission's Rules to Permit Use of Radio Frequencies Above 40 GHz for New Radio Applications*, Third Memorandum Opinion and Order, 15 FCC Rcd 10515, 10518 ¶ 9 (2000).

14/ *See* 47 C.F.R. § 2.106.

Footnote 270 does provide for non-exclusive radio astronomy operations at 72.77 – 72.91 GHz. However, because radio astronomy operations in this band are not even guaranteed protection from services in the same band, there certainly is no reason to restrict usage of a neighboring band.

The Commission previously considered the issue of harmonics from vehicular radar devices in the 77 GHz Proceeding. There, the Commission adopted a spurious emissions limit of 1000 pW/cm², even for emissions that would land directly into a radio astronomy band. ^{15/} This limit translates into approximately 61400 µV/m, nearly 25 times the limit SARA is requesting for the 24 GHz SRR devices. Even the much lower limit of 2 pW/cm² (approximately 2750 µV/m) proposed by the Committee on Radio Frequencies ("CORF") represents a slightly higher limit than the one now being advocated by SARA. In the 77 GHz Proceeding, the Commission called CORF's proposed limit "too strict," noting that

emissions in this frequency range tend to be highly focused and directional. Given that radio astronomy equipment discriminates against off-beam signals and that vehicle radars will be used when in motion, we believe there is little likelihood of interference to radio astronomy operations. ^{16/}

SARA believes that 24 GHz and 77 GHz radars are relatively comparable in terms of their low potential for interference. Interference-mitigating factors such as

^{15/} See *77 GHz Third Report*, 13 FCC Rcd 15074, 15078 ¶ 13 (1998). The third harmonic of radars operating at 76 – 77 GHz fall into the radio astronomy band at 217 – 231 GHz, described by the Committee on Radio Frequencies as "one of the most important" radio astronomy bands. *Id.*

^{16/} *Id.*

atmospheric attenuation, intervening terrain and spatial separation apply to both vehicular radar systems.

In short, SARA's request is extremely modest and eminently reasonable: it is requesting a harmonic emission limit – where the relevant harmonic will not occur in a radio astronomy band – that is sharply lower than the limit adopted for 77 GHz radars. Finally, SARA stresses the need for prompt Commission action on this request to ensure that affordable SRR devices will become a reality. Many critical device design decisions will have to be made over the next year. Thus, in order to assist the development of SRR, the Commission would need to issue a decision by the beginning of 2003, before designs are "locked in" and the production process begins.

III. THE COMMISSION SHOULD NOT REQUIRE ALL RECEIVERS ABOVE 960 MHZ TO COMPLY WITH PART 15 EMISSION LIMITS

Currently, Section 15.101(b) exempts receivers operating above 960 MHz (except CB receivers) from complying with the technical provisions of Part 15, including the emission limits for unintentional radiators. The NPRM notes that the Commission has received reports of interference to very small aperture satellite terminals ("VSATs") caused by radar detectors used to detect police radar. ^{17/} The

^{17/} See NPRM at ¶¶ 11-12. Presumably, the interference was caused in the 11 GHz satellite downlink frequency by radar detectors tuned to the 10.50 – 10.55 GHz band used by police radar.

NPRM requests comment on whether the radar detectors or other receivers should be required to comply with emission limits.

SARA opposes any new broadly-applicable limit for unintentional radio receiver emissions. If, in fact, the Commission determines that particular types of receivers are causing harmful interference to certain services, the Commission should craft a narrowly-focused rule amendment to address the specific problem.

A rule that is overly broad could significantly impact the ability of SARA members to design, manufacture and deploy affordable SRR devices. For example, most SRR devices being developed will rely on a single local oscillator for both transmit and receive functions. When functioning as a receiver, the device will have some spurious emissions resulting from the inability of the switch to suppress all carrier emissions. The use of additional switches to further suppress carrier emissions would be prohibitive both in terms of device size and cost. Therefore, an indiscriminately drafted rule imposing emission limits on receivers or radar detectors 18/ could prevent the public from receiving the substantial safety benefits of these SRR devices. SARA urges the Commission to act cautiously on this issue – and only when supported by specific evidence of harmful interference in the record – to avoid any unintended consequences.

18/ In particular, SARA urges that, because SRR devices can be considered "radar detectors" when operating in receive mode, the Commission should specifically exclude safety-related vehicular

IV. CONCLUSION

To promote the widespread deployment of potentially life-saving vehicular radar systems, SARA urges the Commission: (1) to remove the blanket restricted band status of frequencies above 38.6 GHz, or at a minimum, to remove the restricted status from the 72.0 – 72.75 GHz band, and (2) to avoid the imposition of spurious emission limits on radar detectors and other receivers where not specifically justified by evidence of harmful interference.

Respectfully submitted,

**THE SHORT RANGE AUTOMOTIVE
RADAR FREQUENCY ALLOCATION
GROUP**



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Dated: February 12, 2002

radar detectors from any rule adopted to address interference caused by police radar detectors.